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(71)出願人　000006747
株式会社リコー
東京都大田区中馬込１丁目３番６号

(72)発明者　小松　学
東京都大田区中馬込１丁目３番６号　株式会社リコー内

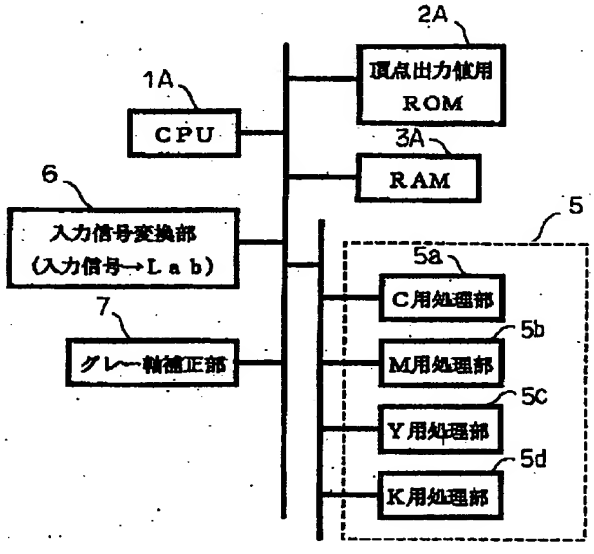
(72)発明者　鈴木　博顕
東京都大田区中馬込１丁目３番６号　株式会社リコー内

(54)【発明の名称】　色変換装置

(57)【要約】

【課題】　モニタのカラー画像情報を、同一色合いの視覚感が得られるハードコピーの画像に作成可能な色変換装置を提供する。

【解決手段】　モニタのカラー画像の基準白色が、カラーハードコピーの紙の白色に、前記カラー画像の黒色が、カラーハードコピーの観察光源での基準白色と同色相の色度値の仮想ハードコピーの黒色になるように、グレー軸を傾けてカラー画像情報の明度に応じて変化された色度値により圧縮されたカラー画像情報に対して、単位立方体に区分された３次元入力色空間への入力座標値を含む単位立方体の頂点の色分解成分の出力値の補間演算により、カラー画像情報がカラーハードコピーを形成する画像形成装置の制御信号に変換され、１種類の色変換パラメータで複数種のモニタのカラー画像に対して、同一の色仕上がりのカラーハードコピーの形成が可能になる。



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【特許請求の範囲】

【請求項１】　光源色によりカラー画像を表示するモニタデバイスのカラー画像情報を、カラーハードコピーを形成する画像形成装置の制御信号に変換する色変換装置であり、

前記カラー画像情報の明度に応じて、色の三属性座標のグレー軸の色度値を変化させる変化手段と、

該変化手段で変化した色度値に基づいて、前記カラー画像情報を前記制御信号に変換する変換手段とを有することを特徴とする色変換装置。

【請求項２】　光源色によりカラー画像を表示するモニタデバイスのカラー画像情報を、カラーハードコピーを形成する画像形成装置の制御信号に変換する色変換装置であり、

前記モニタデバイスのカラー画像の基準白色が、前記カラーハードコピーが形成される記録媒体の地白色に設定され、前記モニタデバイスのカラー画像の黒色が、前記カラーハードコピーを観察する光源下での前記基準白色と同色相の色度値の仮想ハードコピーの黒色に設定されるように、色の三属性座標のグレー軸を傾けて、前記カラー画像情報の明度に応じて色度値を変化させる変化手段と、

該変化手段で変化した色度値に基づいて、前記カラー画像情報を前記制御信号に変換する変換手段とを有することを特徴とする色変換装置。

【請求項３】　光源色によりカラー画像を表示するモニタデバイスのカラー画像情報を、カラーハードコピーを形成する画像形成装置の制御信号に変換する色変換装置であり、

前記モニタデバイスのカラー画像の基準白色が、前記カラーハードコピーが形成される記録媒体の地白色に設定され、前記モニタデバイスのカラー画像の黒色が、前記カラーハードコピーを観察する光源下での前記基準白色と同色相の色度値の仮想ハードコピーの黒色に設定されるように、色の三属性座標のグレー軸を傾けて、前記カラー画像情報の明度に応じて色度値を変化させる変化手段と、

該変化手段で変化された色度値に基づいて、前記カラー画像情報を圧縮処理する圧縮手段と、

無彩色軸を有し、同一の単位色空間立方体に区分分割された３次元入力色空間に対する、前記圧縮手段により圧縮された前記カラー画像情報の入力座標を、該入力座標を含む前記単位色空間立方体の頂点に設定した色分解成分の頂点出力値により補間演算することにより、前記制御信号を求める補間演算手段とを有することを特徴とする色変換装置。

【請求項４】　請求項３記載の色変換装置に対して、前記仮想のハードコピーの色度値を選択設定する選択設定手段が設けられていることを特徴とする色変換装置。

【発明の詳細な説明】

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【０００１】

【発明の属する技術分野】本発明は、ＴＶやＣＲＴモニタに表示される光源色によりカラー画像を表示するモニタデバイスのカラー画像情報を、カラーハードコピーを形成する画像形成装置の制御信号に変換する色変換装置に関する。

【０００２】

【従来の技術】ＴＶやＣＲＴなどのモニタデバイスに表示されるカラー画像のハードコピーを、カラー記録材料上に形成する場合、ハードコピーを観察する光源の色温度が、モニタデバイスの色温度とは異なり、一般にハードコピーを観察する光源の色温度の方が低く、光源色と反射色の色の視覚感の差もあって、色補正なしにモニタデバイスのカラー画像をハードコピーすると、モニタデバイスのカラー画像とは異なる色合のハードコピーが形成されるという問題がある。

【０００３】この問題を解決するために、特開平１－２１８２８８号公報では、カラーＴＶに表示されるカラー画像をカラー記録材料にハードコピーする場合に、ハードコピーの観察光源下におけるカラーＴＶのカラー画像の色の３刺激値を求め、これらの３刺激値を実現するように、カラー記録材料上にハードコピーの記録を行なうカラーハードコピーの形成方法が開示されている。

【０００４】

【発明が解決しようとする課題】開示に係るカラーハードコピーの形成方法では、カラーハードコピーの観察光源を、カラーＴＶの基準白色とした場合に、その基準白色に順応して、カラーハードコピーが、カラーＴＶ本来の光源の色とほぼ同一の色合になるということが前提になっている。確かに、高彩度の色に関しては、人間の眼は基準白色からの相対値で色を知覚するので、カラーハードコピーを観察する際の光源の白色に順応するが、グレー軸近傍の低彩度の色に対しては、色合いの差が目立ってしまい、特に写真などの自然画像については、カラーＴＶの画像とハードコピーとの色合の視覚印象が異なってしまう。一方、カラーＴＶの画像をそのままハードコピーで再現した場合は、本来白であるべき色が、青みがかって再現されてしまう。

【０００５】本発明は、前述したようなモニタデバイスのカラー画像情報をカラーコピーの画像に色変換する色変換装置の現状に鑑みてなされたものであり、その目的は、モニタデバイスのカラー画像情報を、同一の色合いの視覚感が得られるハードコピーの画像に作成可能な色変換装置を提供することにある。

【０００６】

【課題を解決するための手段】前記目的を達成するために、請求項１記載の発明は、光源色によりカラー画像を表示するモニタデバイスのカラー画像情報を、カラーハードコピーを形成する画像形成装置の制御信号に変換する色変換装置であり、前記カラー画像情報の明度に応じ

て、色の三属性座標のグレー軸の色度値を変化させる変化手段と、該変化手段で変化した色度値に基づいて、前記カラー画像情報を前記制御信号に変換する変換手段とを有することを特徴とするものである。

【０００７】同様に前記目的を達成するために、請求項２記載の発明は、光源色によりカラー画像を表示するモニタデバイスのカラー画像情報を、カラーハードコピーを形成する画像形成装置の制御信号に変換する色変換装置であり、前記モニタデバイスのカラー画像の基準白色が、前記カラーハードコピーが形成される記録媒体の地白色に設定され、前記モニタデバイスのカラー画像の黒色が、前記カラーハードコピーを観察する光源下での前記基準白色と同色相の色度値の仮想ハードコピーの黒色に設定されるように、色の三属性座標のグレー軸を傾けて、前記カラー画像情報の明度に応じて色度値を変化させる変化手段と、該変化手段で変化した色度値に基づいて、前記カラー画像情報を前記制御信号に変換する変換手段とを有することを特徴とするものである。

【０００８】同様に前記目的を達成するために、請求項３記載の発明は、光源色によりカラー画像を表示するモニタデバイスのカラー画像情報を、カラーハードコピーを形成する画像形成装置の制御信号に変換する色変換装置であり、前記モニタデバイスのカラー画像の基準白色が、前記カラーハードコピーが形成される記録媒体の地白色に設定され、前記モニタデバイスのカラー画像の黒色が、前記カラーハードコピーを観察する光源下での前記基準白色と同色相の色度値の仮想ハードコピーの黒色に設定されるように、色の三属性座標のグレー軸を傾けて、前記カラー画像情報の明度に応じて色度値を変化させる変化手段と、該変化手段で変化された色度値に基づいて、前記カラー画像情報を圧縮処理する圧縮手段と、無彩色軸を有し、同一の単位色空間立方体に区分分割された３次元入力色空間に対する、前記圧縮手段により圧縮された前記カラー画像情報の入力座標を、該入力座標を含む前記単位色空間立方体の頂点に設定した色分解成分の頂点出力値により補間演算することにより、前記制御信号を求める補間演算手段とを有することを特徴とするものである。

【０００９】同様に前記目的を達成するために、請求項４記載の発明は、請求項３記載の発明に対して、前記仮想のハードコピーの色度値を選択設定する選択設定手段が設けられていることを特徴とするものである。

＊【００１０】

【発明の実施の形態】

［第１の実施の形態］本発明の第１の実施の形態を、図１ないし図４を参照して説明する。図１は本実施の形態の入力色空間に用いられるＲＧＢ空間の説明図、図２は本実施の形態の要部の構成を示すブロック図、図３は本実施の形態の処理の説明図、図４は本実施の形態の色補正の説明図である。

【００１１】本実施の形態では、図１に示すように、ＴＶやＣＲＴモニタのように、光源色によりカラー画像を表示するモニタデバイスのカラー画像情報の入力座標が設定される３次元入力色空間をＲＧＢ色空間とし、このＲＧＢ色空間は、同一の単位色空間立方体に区分分割され、モニタデバイスのカラー画像情報の入力座標値（ＲＧＢ値）に対する出力値として、プリンタの制御信号であるＣ、Ｍ、Ｙ、Ｋ値が、このＲＧＢ色空間から求められるように構成されている。この場合、モニタデバイスのカラー画像情報の入力座標値を含む単位色空間立方体が選択され、選択された単位色空間立方体の予め設定した頂点に対応する出力値と、入力座標値とに基づき線形補間が施されて、プリンタの制御信号であるＣ、Ｍ、Ｙ、Ｋ値に対応する出力値が求められるように構成されている。

【００１２】本実施の形態は、図２に示すように、全体の動作を制御するＣＰＵ１に、入力色空間の頂点に対応する出力値（Ｃ、Ｍ、Ｙ、Ｋ）が予め格納されたＲＯＭ２、入力画像データが一時格納されるＲＡＭ３、及び入力信号に基づき、ＲＯＭ２の格納データを参照して、Ｃ、Ｍ、Ｙ、Ｋ値を補間演算する補間演算部５が接続されている。この補間演算部５には、Ｃ値を演算するＣ用処理部５ａ、Ｍ値を演算するＭ用処理部５ｂ、Ｙ値を演算するＹ用処理部５ｃ、及びＫ値を演算するＫ用処理部５ｄが設けられている。

【００１３】先ず、ＲＯＭ２に格納する入力色空間の頂点（ＲＧＢ）に対する出力値（Ｃ、Ｍ、Ｙ、Ｋ）の決定の処理について説明する。図３に示すように、変換過程１０では、単位色空間立方体の頂点（ＲＧＢ）が、３刺激値ＸＹＺに変換される。この変換は、対象となるモニタデバイスに、頂点に対応するＲＧＢの色を表示して直接測色する方法や、モニタデバイスの蛍光体の色度座標を用いて、次式により演算する方法がある。

【００１４】

$$X=(xR/yR)L(vR)+(xG/yG)L(vG)+(xB/yB)L(vB)\quad Y=L(vR)+L(vG)+L(vB)$$
$$Z=(zR/yR)L(vR)+(zG/yG)L(vG)+(zB/yB)L(vB)\quad \cdots\quad (1)$$

但し、（１）式において、ｘａ、ｙｂ、ｚａ（ａ＝Ｒ、Ｇ、Ｂ）は蛍光体の色度座標、Ｌ（ｖａ）、（ａ＝Ｒ、Ｇ、Ｂ）は輝度値である。

【００１５】次に、変換過程１１において、３刺激値Ｘ、Ｙ、Ｚは、次式により、代表的な均等色空間であるＣＩＥＬａｂに変換される。

【００１６】

$$L^* = 116\,(Y/Y0)^{1/3} - 16$$
$$a^* = 500\,[\,(X/X0)^{1/3} - (Y/Y0)^{1/3}\,]$$
$$b^* = 200\,[\,(Y/Y0)^{1/3} - (Z/Z0)^{1/3}\,] \quad \cdots (2)$$

但し、（2）式において、Y／Y０＞０．００８８５６、Ｘ０、Ｙ０、Ｚ０は基準反射面の値である。

【００１７】ここで、ハードコピーのような物体色では、Ｌ＊が０～１００に収まるが、モニタデバイスの光源色の入力に対しては、上限が定められないので、基準反射面の値Ｘ０、Ｙ０、Ｚ０を、対象のモニタデバイスにおける基準白色の３刺激値として用いている。

【００１８】このように、対象となるモニタデバイスにおいて、白色を基準としてＬ、ａ、ｂに変換された頂点のデータは、色変換過程１２において、カラーハードコピー上で、モニタデバイスに表示された色と同一の色合になるように色補正される。本実施の形態では、図４に＊示すような入力Ｌに対する補正値Ｌ’ａｈ、ｂｈに基づき、過程１１で求めたＬ（明度）に応じて、頂点のデータＬ、ａ、ｂが補正される。例えば、頂点データＬ；５０、ａ；３０、ｂ；－３０が入力されると、次の補間演算が行なわれる。

【００１９】ａｈ＝－２＋（０－（－２））／（６０－５０）／（６０－４０））＝－１

ｂｈ＝－６＋（－４－（－６））／（（６０－５０）／（６０－４０））＝－５

【００２０】これらの結果から次式で、Ｌ’、ａ’、ｂ’が求められる。

【００２１】

$$L' = 40 + (50-40) / ((60-50) / (60-40)) = 45$$
$$a' = 30 + ah = 30 - 1 = 29$$
$$b' = -30 + bh = -30 - 5 = -35 \quad \cdots (3)$$

【００２２】なお、図４の対応関係は、対象となるモニタデバイスのグレー（Ｌ＝０～１００、ａ＝ｂ＝０）の表示とプリンタの出力色とが同一の色合になるようなＣ、Ｍ、Ｙ、Ｋの組合せに対する測色を行なって予め設定して置く。

【００２３】そして、変換過程１３で、以上のように求められた頂点データに対応する補正値Ｌ’、ａ’、ｂ’を、プリンタの制御信号であるＣ、Ｍ、Ｙ、Ｋ値に変換して、頂点出力値としてＲＯＭ２に格納する。この変換過程１３におけるＬ、ａ、ｂ→Ｃ、Ｍ、Ｙ、Ｋ変換は、多項式やニューラルットを使用したＣ、Ｍ、Ｙ、Ｋ→Ｌ、ａ、ｂシュミレータによる最適化や試行錯誤で、補正値Ｌ’、ａ、’ｂ’と色差が最小となるＣ、Ｍ、Ｙ、Ｋの組合せを探す方法などにより行なわれる。

【００２４】［第２の実施の形態］本発明の第２の実施の形態を、図５を参照して説明する。図５は本発明の第２の実施の形態の色補正の説明図である。

【００２５】本実施の形態は、すでに説明した第１の実施の形態に対して、図３に示した色補正過程１２の処理が異なる。図５（ａ）はＣＩＥＬａｂ色空間を、Ｌ軸を垂直にして横から見た図で、Ｐ１は、例えばｄ５０の光源のようなカラーハードコピーを観察する光源下における※

$$L' = L\,(W.L - B.L) / 100 + B.L$$
$$a' = a + (W.a - B.a)\,(L/100) + B.a \quad \cdots (4)$$
$$b' = b + (W.b - B.b)\,(L/100) + B.b$$

ここで、Ｗ．Ｌ、Ｗ．ａ、Ｗ．ｂは、図５のＰ１の座標値（Ｌ、ａ、ｂ）、Ｂ．Ｌ、Ｂ．ａ、Ｂ．ｂは、図５のＰ３の座標値（Ｌ、ａ、ｂ）である。

【００３０】本実施の形態でも、変換過程（図３の変換過程１３に対応）において、以上のようにして求めた頂点に対応する補正値（Ｌ’、ａ’、ｂ’）から、プリンタの制御信号であるＣ、Ｍ、Ｙ、Ｋ値への変換が行なわれ、得られたデータが頂点出力値としてＲＯＭ２に格納される。

【００３１】［第３の実施の形態］本発明の第３の実施の形態を、図６及び図７を参照して説明する。図６は本実施の形態の入力色空間に用いられるＣＩＥＬＡＢ色空

※るカラーハードコピーを形成する紙などの記録材料の色（ハードコピー側のｗｈｉｔｅ　ｐｏｉｎｔ）、Ｐ２はハードコピーを観察する光源下におけるハードコピーの黒色（ハードコピー側のｂｌａｃｋ　ｐｏｉｎｔ）で、ハードコピー側の本来のグレー軸Ａｇは、Ｐ１、Ｐ２を結ぶ直線となる。

【００２６】同図（ｂ）は、（ａ）でＰ２、Ｐ３を結ぶ点線が示す等明度面を真上（Ｌ軸方向）から見た図であり、Ｗはカラーハードコピーを観察する光源下におけるモニタデバイスの基準白色（モニタ側のｗｈｉｔｅ　ｐｏｉｎｔ）の色度値（ａ、ｂ）のみを等明度面に持ってきた色、Ｐ３はＷと同色相線上にある任意の色を示している。

【００２７】本実施の形態では、色補正過程（第１の実施の形態の色補正過程１２に対応）で、入力カラー情報のグレー軸が、図５（ａ）に示すように、Ｐ１、Ｐ３を結ぶ仮想のグレー軸Ａｇ’になるように色補正される。

【００２８】即ち、変換過程（図３の変換過程１１に対応）でＬ、ａ、ｂに変換された頂点データは、色補正過程（図３の色補正過程１２に対応）で、次式によりＬ’、ａ’、ｂ’に変換される。

【００２９】

間の説明図、図７は本実施の形態の要部の構成を示すブロック図である。

【００３２】本実施の形態では、ＴＶやＣＲＴモニタのように、光源色によりカラー画像を表示するモニタデバイスのカラー画像情報に、Ｌａｂ変換が施され、入力座標が設定される３次元入力色空間を、図６に示すようなＣＩＥＬａｂ色空間とし、このＣＩＥＬａｂ色空間は、同一の単位色空間立方体に区分分割され、モニタデバイスのカラー画像情報の入力座標値（Ｌ＊、ａ＊、ｂ＊値）に対する出力値として、プリンタの制御信号であるＣ、Ｍ、Ｙ、Ｋ値が、このＣＩＥＬａｂ色空間から求められるように構成されている。この場合、モニタデバイスのカラー画像情報の入力座標値を含む単位色空間立方体が選択され、選択された単位色空間立方体の予め設定した頂点に対応する出力値と、入力座標値とに基づき線形補間が施されて、プリンタの制御信号であるＣ、Ｍ、Ｙ、Ｋ値に対応する出力値が求められるように構成されている。

【００３３】本実施の形態は、図７に示すように、全体の動作を制御するＣＰＵ１Ａに、入力色空間の頂点に対応する出力値（Ｃ、Ｍ、Ｙ、Ｋ）が予め格納されたＲＯＭ２Ａ、入力画像データが一時格納されるＲＡＭ３Ａ、入力信号に基づき、ＲＯＭ２Ａの格納データを参照して、Ｃ、Ｍ、Ｙ、Ｋ値を補間演算する補間演算部５、入力画像信号を入力側のデバイスプロファイルに基づいて、補間演算の入力空間であるＣＩＥＬａｂ空間に変換する入力信号変換部６、及び入力信号変換部６で変換した信号のグレー軸の補正に伴う色補正と、明度成分（Ｌ）の圧縮処理とを行なうグレー軸補正部が接続されている。また、補間演算部５には、Ｃ値を演算するＣ用処理部５ａ、Ｍ値を演算するＭ用処理部５ｂ、Ｙ値を演算するＹ用処理部５ｃ、及びＫ値を演算するＫ用処理部５ｄが設けられている。

【００３４】本実施の形態の動作を説明すると、ＣＰＵ１Ａが色補正の指令を受けると、入力信号がモニタデバイスのカラー画像情報（ＲＧＢ）であると、入力信号変換部６において、ＲＧＢ→ＸＹＺ→Ｌａｂ変換が実施される。この入力信号変換部６での変換は、例えば第１の実施の形態の（１）式及び（２）式により行なわれる。なお、この変換に必要な各パラメータは、カラー画像情報と共に送られるモニタデバイスのデバイスプロファイルに書込まれており、対象のモニタデバイスの白色（Ｌａｂ；１００、０、０）を基準としたＬａｂに変換される。

【００３５】入力信号変換部６で変換された入力画像信号（Ｌａｂ）は、グレー軸補正部７において、第２の実施の形態の（４）式と同様な処理により、カラーハードコピー上でモニタデバイスのカラー画像と同一な色合に表示されるように、色補正されてＬ’ａ’ｂ’に変換され、ＲＡＭ３Ａにロードされる。

【００３６】この色補正によって、モニタデバイスのカラー画像の基準白色が、カラーハードコピーを形成する紙の地白色となり、モニタデバイスのカラー画像の黒色が、カラーハードコピーを観察する光源下におけるモニタデバイスのカラー画像の基準白色と同色相の色度値を持つ仮想のハードコピーの黒色となるように、グレー軸の補正に伴う色補正と明度成分（Ｌ）の圧縮処理が実施される。

【００３７】ＲＡＭ３Ａにロードされた色情報（Ｌ’ａ’ｂ’）は、補間演算部５に転送され、Ｃ用処理部５ａ、Ｍ用処理部５ｂ、Ｙ用処理部５ｃ、Ｋ用処理部５ｄにより、補間演算されＬ’ａ’ｂ’→ＣＭＹＫの色変換が行なわれる。この場合、補間演算に使用される入力空間上の座標（Ｌａｂ）には、色再現範囲外の色には、彩度方向の貼り付けによる圧縮処理が施されたＬ、ａ、ｂ値に対するＣ、Ｍ、Ｙ、Ｋの値が予め設定してある。また、このＬ、ａ、ｂ値に対する出力値（Ｃ、Ｍ、Ｙ、Ｋ）の設定は、多項式やニューラルネットを使用したＣＭＹＫ→Ｌａｂシュミレータによる最適化などで、補正値色差が最小となるＣＭＹＫの組合せが求められる。

【００３８】［第４の実施の形態］本発明の第４の実施の形態を、図８を参照して説明する。図８は本実施の構成の要部の構成を示すブロック図である。

【００３９】本実施の形態では、図８に示すように、全体の動作を制御するＣＰＵ１Ｂに、入力色空間の頂点に対応する出力値（Ｃ、Ｍ、Ｙ、Ｋ）が予め格納されたＲＯＭ２Ｂ、入力画像データが一時格納されるＲＡＭ３Ｂ、入力信号に基づき、ＲＯＭ２Ｂの格納データを参照して、Ｃ、Ｍ、Ｙ、Ｋ値を補間演算する補間演算部５、入力画像信号を入力側のデバイスプロファイルに基づいて、補間演算の入力空間であるＣＩＥＬａｂ空間に変換する入力信号変換部６、入力信号変換部６で変換した信号のグレー軸の補正に伴う色補正と、明度成分（Ｌ）の圧縮処理とを行なうグレー軸補正部７、及び仮想のハードコピーの黒の色度値を、オペレータが調整設定する仮想グレー軸設定部８が接続されている。また、補間演算部５には、Ｃ値を演算するＣ用処理部５ａ、Ｍ値を演算するＭ用処理部５ｂ、Ｙ値を演算するＹ用処理部５ｃ、及びＫ値を演算するＫ用処理部５ｄが設けられている。

【００４０】本実施の形態の動作を説明すると、ＣＰＵ１Ｂが色補正の指令を受けると、入力信号がモニタデバイスのカラー画像情報（ＲＧＢ）であると、入力信号変換部６において、ＲＧＢ→ＸＹＺ→Ｌａｂ変換が実施される。この入力信号変換部６での変換は、例えば第１の実施の形態の（１）式及び（２）式により行なわれる。なお、この変換に必要な各パラメータは、カラー画像情報と共に送られるモニタデバイスのデバイスプロファイルに書込まれており、対象のモニタデバイスの白色（Ｌａｂ；１００、０、０）を基準としたＬａｂに変換される。

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【００４１】入力信号変換部６で変換された入力画像信号（Ｌａｂ）は、グレー軸補正部７において、第２の実施の形態の（４）式と同様な処理により、カラーハードコピー上でモニタデバイスのカラー画像と同一な色合に表示されるように、色補正されてＬ’ａ’ｂ’に変換され、ＲＡＭ３Ｂにロードされる。

【００４２】本実施の形態では、この場合に、カラーハードコピーを観察する光源下におけるモニタデバイスの基準白色Ｗと同色相線上にある任意の色Ｐ３（図５参照）を、オペレータが調整設定することができ、モニタデバイスのカラー画像の基準白色が、カラーハードコピーが形成される紙の地白色となり、モニタデバイスのカラー画像の黒色が、カラーハードコピーを観察する光源下におけるモニタデバイスの基準白色と同色相の色を基本に、オペレータが好みや入力画像に応じて調整した仮想のハードコピーの黒色となるように、グレー軸の補正に伴う色補正と明度（Ｌ）の圧縮処理が実施される。

【００４３】ＲＡＭ３Ａにロードされた色情報（Ｌ’ａ’ｂ’）は、補間演算部５に転送され、Ｃ用処理部５ａ、Ｍ用処理部５ｂ、Ｙ用処理部５ｃ、Ｋ用処理部５ｄにより、補間演算されＬ’ａ’ｂ’→ＣＭＹＫの色変換が行なわれる。この場合、補間演算に使用される入力空間上の座標（Ｌａｂ）には、色再現範囲外の色には、彩度方向の貼り付けによる圧縮処理が施されたＬ、ａ、ｂ値に対するＣ、Ｍ、Ｙ、Ｋの値が予め設定してある。また、このＬ、ａ、ｂ値に対する出力値（Ｃ、Ｍ、Ｙ、Ｋ）の設定は、多項式やニューラルネットを使用したＣＭＹＫ→Ｌａｂシュミレータによる最適化などで、補正値色差が最小となるＣＭＹＫの組合せが求められる。

【００４４】

【発明の効果】請求項１記載の発明によると、変化手段によって、カラー画像情報の明度に応じて、色の三属性座標のグレー軸の色度値を変化し、変化された色度値に基づいて、変換手段によって、光源色によりカラー画像を表示するモニタデバイスのカラー画像情報が、カラーハードコピーを形成する画像形成装置の制御信号に変換されるので、モニタデバイスのカラー画像と同一の色仕上がりでカラーハードコピーを形成することが可能になる。

【００４５】請求項２記載の発明によると、モニタデバイスのカラー画像の基準白色が、カラーハードコピーが形成される記録媒体の地白色に設定され、モニタデバイスのカラー画像の黒色が、カラーハードコピーを観察する光源下での前記基準白色と同色相の色度値の仮想ハードコピーの黒色に設定されるように、変化手段によって、色の三属性座標のグレー軸を傾けることにより、カラー画像情報の明度に応じて色度値が変化され、変化された色度値に基づいて、変換手段によって、カラー画像情報がカラーハードコピーを形成する画像形成装置の制御信号に変換されるので、細かいパラメータの設定なしに簡単に、モニタデバイスのカラー画像と同一の色仕上がりでカラーハードコピーを形成することが可能になる。

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【００４６】請求項３記載の発明によると、変化手段によって、モニタデバイスのカラー画像の基準白色が、カラーハードコピーが形成される記録媒体の地白色に設定され、モニタデバイスのカラー画像の黒色が、カラーハードコピーを観察する光源下での基準白色と同色相の色度値の仮想ハードコピーの黒色に設定されるように、色の三属性座標のグレー軸が傾けられて、カラー画像情報の明度に応じて色度値が変化され、変化された色度値に基づいて、圧縮手段によってカラー画像情報が圧縮処理され、圧縮されたカラー画像情報に対して、無彩色軸を有し同一の単位色空間立方体に区分分割された３次元入力色空間への入力座標値が設定され、補間演算手段によって、該入力座標値を含む単位色空間立方体の頂点に設定した色分解成分の頂点出力値の補間演算が行なわれ、変換手段によって、補間演算値に基づいて、カラー画像情報がカラーハードコピーを形成する画像形成装置の制御信号に変換されるので、メモリの増設なしに１種類の色変換パラメータで、複数種のモニタデバイスのカラー画像に対して、同一の色仕上がりでカラーハードコピーを形成することが可能になる。

【００４７】請求項４記載の発明によると、請求項３記載の発明で得られる効果に加えて、選択設定手段によって、仮想のハードコピーの色度値を選択して、モニタデバイスのカラー画像情報の特性を強調するなど、カラーハードコピーの色仕上げを調整することが可能になる。

【図面の簡単な説明】

■

【図１】本発明の第１の実施の形態の入力色空間に用いられるＲＧＢ空間の説明図である。

【図２】同実施の形態の要部の構成を示すブロック図である。

【図３】同実施の形態の処理の説明図である。

【図４】同実施の形態の色補正の説明図である。

【図５】本発明の第２の実施の形態の色補正の説明図である。

【図６】本発明の第３の実施の形態の入力色空間に用いられるＣＩＥＬＡＢ色空間の説明図である。

【図７】同実施の形態の要部の構成を示すブロック図である。

【図８】本発明の第４の実施の構成の要部の構成を示すブロック図である。

【符号の説明】

１、１Ａ、１Ｂ　ＣＰＵ
２、２Ａ、２Ｂ　ＲＯＭ
３、３Ａ、３Ｂ　ＲＡＭ
５　補間処理部
５ａ　Ｃ用処理部

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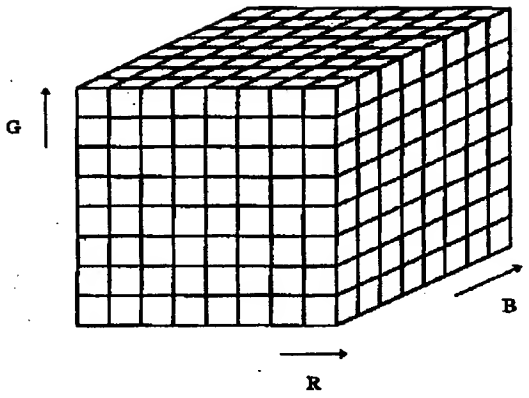
５ｂ　Ｍ用処理部
５ｃ　Ｙ用処理部
５ｄ　Ｋ用市より部

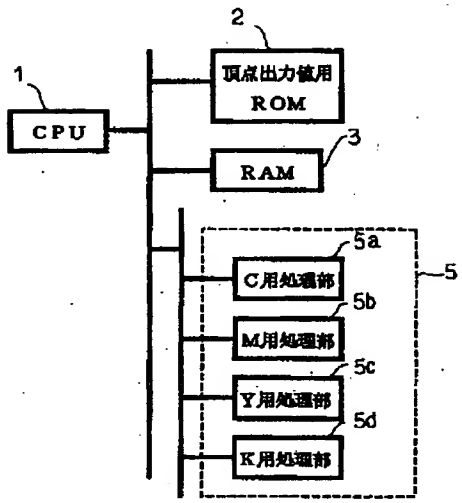
12

６　入力信号変換部
７　グレー軸補正部
８　仮想グレー軸設定部

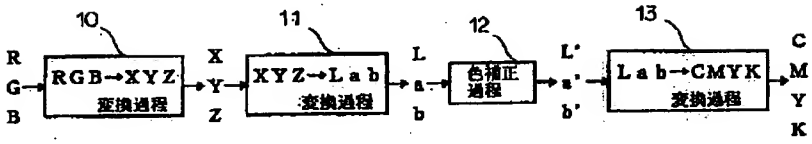
【図１】



【図２】



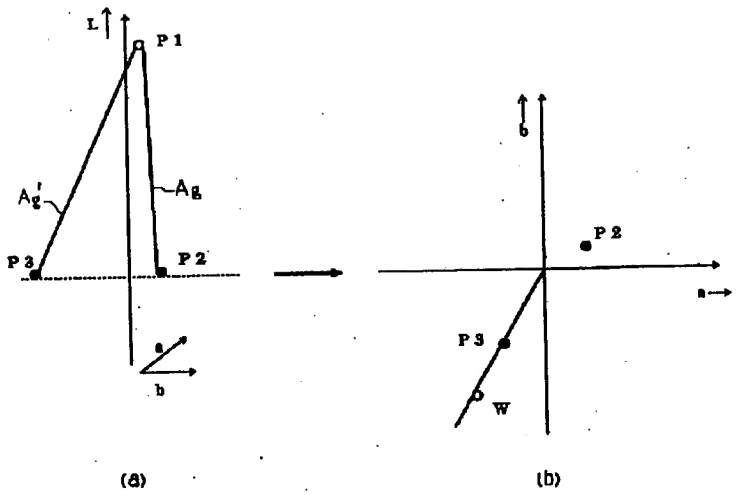
【図３】



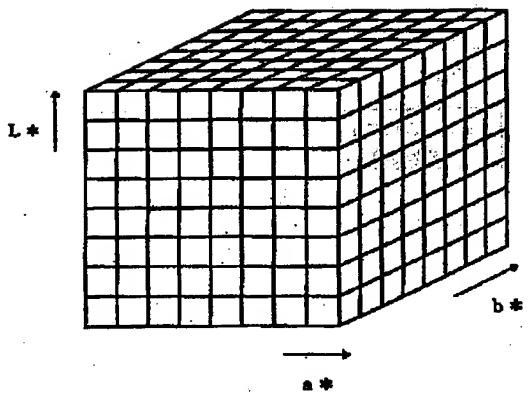
【図４】

L	L*	ah	bh
0	15	−3.5	−10.0
20	25	−3.0	−9.0
40	40	−2.0	−6.0
60	60	0.0	−4.0
80	70	0.7	−4.0
100	90	1.0	−3.6

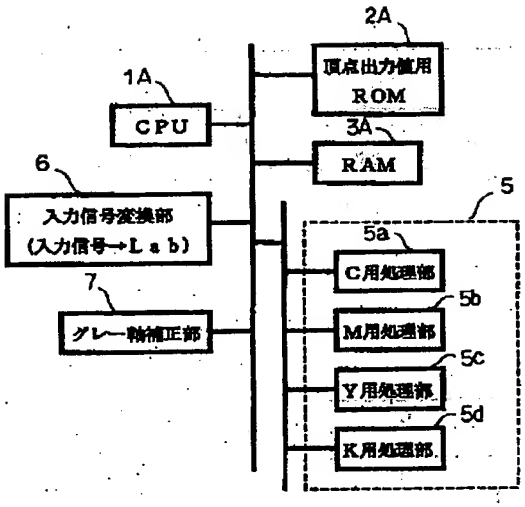
【図５】


L
P1
Ag'
Ag
P3
P2
a
b
(a)
b
P2
a
P3
W
(b)

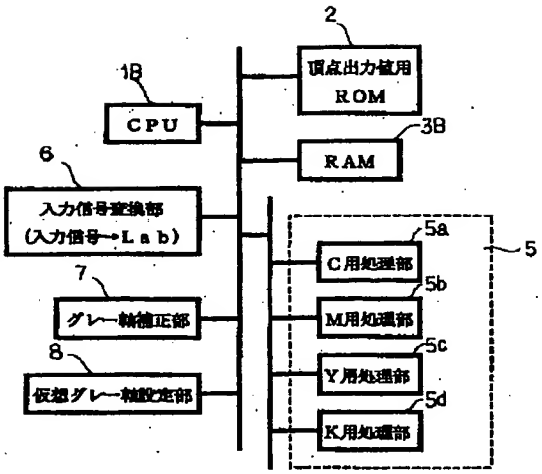
【図６】


L*
b*
a*

【図７】


2A
頂点出力値用
ROM
1A
CPU
3A
RAM
6
入力信号変換部
(入力信号→L a b)
5
5a
C用処理部
7
5b
グレー軸補正部
M用処理部
5c
Y用処理部
5d
K用処理部

【図８】



フロントページの続き

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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The color inverter characterized by to have a change means are the color inverter which changes the color-picture information on the monitor device which displays a color picture with a self-luminous color into the control signal of the image-formation equipment which forms color hard copy, and change the chromaticity value of the gray shaft of the three-attributes-of-color coordinate of a color according to the lightness of said color-picture information, and a conversion means change said color-picture information into said control signal based on the chromaticity value which changed with this change means.
[Claim 2] The color picture information on the monitor device which displays a color picture with a self-luminous color It is the color inverter changed into the control signal of the image formation equipment which forms color hard copy. The reference white of the color picture of said monitor device is set as the ground white of the record medium with which said color hard copy is formed. So that the black of the color picture of said monitor device may be set as said reference white under the light source which observes said color hard copy, and the black of the virtual hard copy of the chromaticity value of a same color phase The color inverter characterized by leaning the gray shaft of the three-attributes-of-color coordinate of a color, and having a change means to change a chromaticity value according to the lightness of said color picture information, and a conversion means to change said color picture information into said control signal based on the chromaticity value which changed with this change means.
[Claim 3] The color picture information on the monitor device which displays a color picture with a self-luminous color It is the color inverter changed into the control signal of the image formation equipment which forms color hard copy. The reference white of the color picture of said monitor device is set as the ground white of the record medium with which said color hard copy is formed. So that the black of the color picture of said monitor device may be set as said reference white under the light source which observes said color hard copy, and the black of the virtual hard copy of the chromaticity value of a same color phase A change means to lean the gray shaft of the three-attributes-of-color coordinate of a color, and to change a chromaticity value according to the lightness of said color picture information, The compression means which carries out compression processing of said color picture information based on the chromaticity value which changed with this change means, Have an achromatic color shaft and receive the same unit color space cube in the three-dimension input color space by which partition division was carried out. The color inverter characterized by having a interpolation operation means to search for said control signal by carrying out a interpolation operation with the top-most-vertices output value of the color-separation component which set the input coordinate of said color picture information compressed by said compression means as the top-most vertices of said unit color space cube including this input coordinate.
[Claim 4] The color inverter characterized by establishing the selection setting means which carries out a selection setup of the chromaticity value of the hard copy of said imagination to a color inverter according to claim 3.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the color inverter which changes the color picture information on the monitor device which displays a color picture with the self-luminous color displayed on TV or a CRT monitor into the control signal of the image formation equipment which forms color hard copy.
[0002]
[Description of the Prior Art] The hard copy of the color picture displayed on monitor devices, such as TV and CRT When forming on a color record ingredient, the color temperature of the light source which observes hard copy If unlike the color temperature of a monitor device it is low, and the difference of the feeling of vision of the color of a self-luminous color and a reflected color also has the direction of the color temperature of the light source which generally observes hard copy and it carries out hard copy of the color picture of a monitor device without color correction There is a problem that the hard copy of different tone from the color picture of a monitor device is formed.
[0003] By JP,1-218288,A, the tristimulus value of the color of the color picture of the color TV under the observation light source of hard copy is calculated, and in order to solve this problem, when carrying out hard copy of the color picture displayed on a color TV to a color record ingredient, the formation approach of the color hard copy which records hard copy on a color record ingredient is indicated so that these tristimulus values may be realized.
[0004]
[Problem(s) to be Solved by the Invention] By the formation approach of the color hard copy concerning an indication, when the observation light source of color hard copy is made into the reference white of a color TV, it is adapted to the reference white and it is the requisite to say [that color hard copy becomes the almost same tone as the color of the light source of color TV original]. Although surely it is adapted to the white of the light source at the time of observing color hard copy since human being's eye perceives a color by the relative value from a reference white about the color of high saturation, to the color of low saturation near the gray shaft, the difference of a tint will be conspicuous and the vision impressions of the tone of the image of a color TV and hard copy will differ especially about natural images, such as a photograph. On the other hand, when the image of a color TV is reproduced by hard copy as it was, the color which should be white essentially will be bluish and will be reproduced.
[0005] This invention is made in view of the present condition of the color inverter which carries out color conversion of the color picture information on a monitor device which was mentioned above at the image of a color copy, and the purpose is in offering the color inverter which can create the color picture information on a monitor device in the image of hard copy with which the feeling of vision of the same tint is obtained.
[0006]
[Means for Solving the Problem] In order to attain said purpose, invention according to claim 1 The color picture information on the monitor device which displays a color picture with a self-luminous color A change means to be the color inverter changed into the control signal of the

image formation equipment which forms color hard copy, and to change the chromaticity value of the gray shaft of the three-attributes-of-color coordinate of a color according to the lightness of said color picture information, It is characterized by having a conversion means to change said color picture information into said control signal, based on the chromaticity value which changed with this change means.

[0007] In order to attain said purpose similarly, invention according to claim 2 The color picture information on the monitor device which displays a color picture with a self-luminous color It is the color inverter changed into the control signal of the image formation equipment which forms color hard copy. The reference white of the color picture of said monitor device is set as the ground white of the record medium with which said color hard copy is formed. So that the black of the color picture of said monitor device may be set as said reference white under the light source which observes said color hard copy, and the black of the virtual hard copy of the chromaticity value of a same color phase The gray shaft of the three-attributes-of-color coordinate of a color is leaned, and it is characterized by having a change means to change a chromaticity value according to the lightness of said color picture information, and a conversion means to change said color picture information into said control signal based on the chromaticity value which changed with this change means.

[0008] In order to attain said purpose similarly, invention according to claim 3 The color picture information on the monitor device which displays a color picture with a self-luminous color It is the color inverter changed into the control signal of the image formation equipment which forms color hard copy. The reference white of the color picture of said monitor device is set as the ground white of the record medium with which said color hard copy is formed. So that the black of the color picture of said monitor device may be set as said reference white under the light source which observes said color hard copy, and the black of the virtual hard copy of the chromaticity value of a same color phase A change means to lean the gray shaft of the three-attributes-of-color coordinate of a color, and to change a chromaticity value according to the lightness of said color picture information, The compression means which carries out compression processing of said color picture information based on the chromaticity value which changed with this change means, Have an achromatic color shaft and receive the same unit color space cube in the three-dimension input color space by which partition division was carried out. It is characterized by having a interpolation operation means to search for said control signal by carrying out a interpolation operation with the top-most-vertices output value of the color-separation component which set the input coordinate of said color picture information compressed by said compression means as the top-most vertices of said unit color space cube including this input coordinate.

[0009] In order to attain said purpose similarly, invention according to claim 4 is characterized by establishing the selection setting means which carries out a selection setup of the chromaticity value of the hard copy of said imagination to invention according to claim 3.

[0010]

[Embodiment of the Invention]

The gestalt of operation of the 1st of [gestalt of the 1st operation] this invention is explained with reference to drawing 1 thru/or drawing 4 . The explanatory view of processing of the gestalt of this operation and drawing 4 of the explanatory view of the RGB space where drawing 1 is used for the input color space of the gestalt of this operation, the block diagram in which drawing 2 shows the configuration of the important section of the gestalt of this operation, and drawing 3 are the explanatory views of the color correction of the gestalt of this operation.

[0011] As shown in drawing 1 , with the gestalt of this operation like TV or a CRT monitor The three-dimension input color space where the input coordinate of the color picture information on the monitor device which displays a color picture with a self-luminous color is set up is made into a RGB color space. This RGB color space It is constituted so that partition division may be carried out and the same unit color space cube may be asked for C, M, Y, and K value which are the control signal of a printer from this RGB color space as an output value over the input coordinate value (RGB value) of the color picture information on a monitor device. In this case, the unit color space cube containing the input coordinate value of the color picture information

on a monitor device is chosen, and linear interpolation is given based on the output value corresponding to the top-most vertices set up beforehand and input coordinate value of the selected unit color space cube, and it is constituted so that the output value corresponding to C, M, Y, and K value which are the control signal of a printer may be calculated.
[0012] As shown in drawing 2 , based on ROM2 by which the output value (C, M, Y, K) corresponding to the top-most vertices of an input color space was beforehand stored in CPU1 which controls the whole actuation, RAM3 to which the temporary storage of the input image data is carried out, and an input signal, as for the gestalt of this operation, the interpolation operation part 5 which carries out the interpolation operation of C, M, Y, and K value with reference to the storing data of ROM2 is connected. Processing section 5for C a which calculates C value, processing section 5for M b which calculates M value, processing section 5for Y c which calculates Y value, and 5d of processing sections for K which calculate K value are prepared in this interpolation operation part 5.
[0013] First, the processing of the decision of an output value (C, M, Y, K) to the top-most vertices (RGB) of the input color space stored in ROM2 is explained. As shown in drawing 3 , in the conversion process 10, the top-most vertices (RGB) of a unit color space cube are changed into a tristimulus value XYZ. This conversion has the approach of displaying and carrying out the direct colorimetry of the color of RGB corresponding to top-most vertices to the target monitor device, and the approach of calculating by the degree type using the chromaticity coordinate of the fluorescent substance of a monitor device.
[0014]
X=(xR /yR)L(vR)+(xG /yG)L(vG)+(xB /yB)L(vB) Y=L(vR)+L(vG)+L(vB)
Z=(zR/yR) L(vR) +(zG/yG) L(vG) +(zB/yB) L (vB) ... (1)
However, in (1) type, a=R, and (G, B) of xa, yb, and za (a=R, G, B) are brightness values. [the chromaticity coordinate of a fluorescent substance, L (va) and]
[0015] Next, tristimulus values X, Y, and Z are changed into CIELab which is typical uniform color space by the degree type in the conversion process 11.
[0016]
L*=116(Y/Y0)1/3 -16 a*=500[(X/X0)1/3 -(Y/Y0)1/3]
b*=200 [(Y/Y0) 1/3-(Z/Z0) 1 / 3] ... (2)
However, in (2) types, Y/Y 0> 0.008856, and X0, Y0 and Z0 are the values of a criteria reflector.
[0017] Here, in the object color like hard copy, although L* is settled in 0-100, since an upper limit is not defined to the input of the self-luminous color of a monitor device, the values X0, Y0, and Z0 of a criteria reflector are used as a tristimulus value of the reference white in the target monitor device.
[0018] Thus, in the target monitor device, in the color conversion process 12, color correction of the data of top-most vertices changed into L, a, and b on the basis of white is carried out so that it may become the same tone as the color displayed on the monitor device on color hard copy. With the gestalt of this operation, the data L, a, and b of top-most vertices are amended according to L (lightness) for which it asked in the process 11 based on correction value L'ah to the input L as shown in drawing 4 , and bh. For example, an input of the top-most-vertices data L; 50, a; 30, and b;-30 performs the next interpolation operation.
[0019] ah=-2+(0- (-2))/(60-50)/(60-40) =-1bh=-6+(-4- (-6))/(60-50) (/(60-40)) =-5[0020] these -- a result -- from -- a degree -- a type -- L -- ' -- a -- ' -- b -- ' -- asking -- having .
[0021]
L'=40+(50-40)/(60-50) (/(60-40)) =45 a'=30+ah=30-1=29 b'=-30+bh=-30-5=-35 ... (3)
[0022] In addition, the correspondence relation of drawing 4 performs the colorimetry to the combination of C, M, Y, and K from which target display of the gray (L=0-100, a=b=0) of a monitor device and output color of a printer become the same tone, and it is set up beforehand and it places it.
[0023] and -- conversion -- a process -- 13 -- above -- asking -- having had -- top-most vertices -- data -- corresponding -- correction value -- L -- ' -- a -- ' -- b -- ' -- a printer -- a control signal -- it is -- C -- M -- Y -- K value -- changing -- as a top-most-vertices

output value -- ROM2 -- storing . L in this conversion process 13, a, b->C, M and Y, and K conversion are the optimization and trial-and-error by C, M, Y, K->L and a which used a polynomial and new RARUTTO, and b simulator, and are performed by correction value L', the method of looking for the combination of C, M, Y, and K from which a, 'b', and the color difference serve as min, etc.

[0024] The gestalt of operation of the 2nd of [gestalt of the 2nd operation] this invention is explained with reference to drawing 5 . Drawing 5 is the explanatory view of the color correction of the gestalt of operation of the 2nd of this invention.

[0025] The processings of the color correction process 12 shown in drawing 3 to the gestalt of the 1st operation which already explained the gestalt of this operation differ. Drawing 5 (a) is drawing which made L shaft perpendicular and looked at the CIELab color space from width. P1 For example, the color of record ingredients, such as paper which forms the color hard copy under the light source which observes color hard copy like the light source of d50, (white point by the side of hard copy), P2 is the black (black point by the side of hard copy) of the hard copy under the light source which observes hard copy, and the original gray shaft Ag by the side of hard copy serves as a straight line which connects P1 and P2.

[0026] It is drawing which looked at a lightness side -- the dotted line which connects P2 and P3 with (a) shows this drawing (b) -- from right above (L shaft orientations). The color which brought W to the lightness [value / (a, b) / of the reference white (white p0int by the side of a monitor) of the monitor device under the light source which observes color hard copy / chromaticity] side, and P3 show the color of the arbitration on W and this hue line.

[0027] In the gestalt of this operation, in a color correction process (it corresponds to the color correction process 12 of the gestalt of the 1st operation), as shown in drawing 5 (a), color correction of the gray shaft of input color information is carried out so that it may become gray shaft Ag' of the imagination which connects P1 and P3.

[0028] namely, -- conversion -- a process (it corresponds to the conversion process 11 of drawing 3) -- L -- a -- b -- changing -- having had -- top-most vertices -- data -- color correction -- a process (it corresponds to the color correction process 12 of drawing 3) -- it is -- a degree -- a type -- L -- ' -- a -- ' -- b -- ' -- changing -- having .

[0029]

L'=L(W. L-B.L) /100+B.L a'=a+(W. a-B.a) (L/100) +B.a ... (4)

b'=b+(W. b-B.b) (L/100) +B.b -- here, the coordinate value of P1 of drawing 5 (L, a, b), B.L, B.a, and B.b of W.L, W.a, and W.b are the coordinate values of P3 of drawing 5 (L, a, b).

[0030] conversion to C, M, Y, and K value which are the control signal of a printer from the correction value (L', a', and b -- ') corresponding to the top-most vertices for which it asked as mentioned above also with the gestalt of this operation in the conversion process (it corresponds to the conversion process 13 of drawing 3) is performed, and the obtained data are stored in ROM2 as a top-most-vertices output value.

[0031] The gestalt of operation of the 3rd of [gestalt of the 3rd operation] this invention is explained with reference to drawing 6 and drawing 7 . The explanatory view of the CIELAB color space where drawing 6 is used for the input color space of the gestalt of this operation, and drawing 7 are the block Figs. showing the configuration of the important section of the gestalt of this operation.

[0032] With the gestalt of this operation, like TV or a CRT monitor to the color picture information on the monitor device which displays a color picture with a self-luminous color Lab conversion is performed and it considers as a CIELab color space as shows the three-dimension input color space where an input coordinate is set up to drawing 6 . This CIELab color space It is constituted so that partition division may be carried out and the same unit color space cube may be asked for C, M, Y, and K value which are the control signal of a printer from this CIELab color space as an output value over the input coordinate value (L*, a*, b* value) of the color picture information on a monitor device. In this case, the unit color space cube containing the input coordinate value of the color picture information on a monitor device is chosen, and linear interpolation is given based on the output value corresponding to the top-most vertices set up beforehand and input coordinate value of the selected unit color space cube, and it is

constituted so that the output value corresponding to C, M, Y, and K value which are the control signal of a printer may be calculated.
[0033] As shown in drawing 7 , the gestalt of this operation to CPU1A which controls the whole actuation The storing data of ROM2A are referred to based on ROM2A in which the output value (C, M, Y, K) corresponding to the top-most vertices of an input color space was stored beforehand, RAM3A to which the temporary storage of the input image data is carried out, and an input signal. The interpolation operation part 5 and the input picture signal which carry out the interpolation operation of C, M, Y, and K value are based on the device profile of an input side. The gray stem correction section which performs color correction accompanying amendment of the gray shaft of a signal changed by the input signal transducer 6 changed into the CIELab space which is the input space of a interpolation operation, and the input signal transducer 6, and compression processing of a lightness component (L) is connected. Moreover, processing section 5for C a which calculates C value, processing section 5for M b which calculates M value, processing section 5for Y c which calculates Y value, and 5d of processing sections for K which calculate K value are prepared in the interpolation operation part 5.
[0034] If actuation of the gestalt of this operation is explained and CPU1A will receive the command of color correction, in the input signal transformation section 6, RGB->XYZ->Lab conversion will be carried out as an input signal is the color picture information (RGB) on a monitor device. Conversion by this input signal transducer 6 is performed by for example, (1) type of the gestalt of the 1st operation and (2) types. In addition, it is written in the device profile of the monitor device sent with color picture information, and gets down, and each parameter required for this conversion is changed into Lab on the basis of the white (0 Lab;100, 0) of the target monitor device.
[0035] In the gray stem correction section 7, color correction of the input picture signal (Lab) changed by the input signal transducer 6 is carried out, it is changed into L'a'b', and is loaded to RAM3A by the same processing as (4) types of the gestalt of the 2nd operation so that it may be displayed on the same tone as the color picture of a monitor device on color hard copy.
[0036] By this color correction, the reference white of the color picture of a monitor device turns into ground white of the paper which forms color hard copy, and compression processing of the color correction accompanying [so that it may become black] amendment of a gray shaft and the lightness component (L) of the reference white of the color picture of the monitor device under the light source to which the black of the color picture of a monitor device observes color hard copy, and the hard copy of imagination with the chromaticity value of a same color phase is carried out.
[0037] The color information (L'a'b') loaded to RAM3A is transmitted to the interpolation operation part 5, a interpolation operation is carried out by 5d of processing sections for processing section 5for C a, processing section 5for M b, processing section 5for Y c, and K, and color conversion of L'a'b'->CMYK is performed. In this case, the value of L and a to which compression processing by attachment of the saturation direction was performed, and C, M, Y and K to b value is beforehand set to the color outside the color reproduction range at the coordinate (Lab) on the input space used for a interpolation operation. Moreover, a setup of the output value (C, M, Y, K) over this L and a, and b value is optimization by the CMYK->Lab simulator which used the polynomial and the neural network etc., and the combination of CMYK from which the correction value color difference serves as min is searched for.
[0038] The gestalt of operation of the 4th of [gestalt of the 4th operation] this invention is explained with reference to drawing 8 . Drawing 8 is the block diagram showing the configuration of the important section of the configuration of this operation.
[0039] To CPU1B which controls the whole actuation by the gestalt of this operation to be shown in drawing 8 The storing data of ROM2B are referred to based on ROM2B in which the output value (C, M, Y, K) corresponding to the top-most vertices of an input color space was stored beforehand, RAM3B to which the temporary storage of the input image data is carried out, and an input signal. The interpolation operation part 5 and the input picture signal which carry out the interpolation operation of C, M, Y, and K value are based on the device profile of an input side. The color correction accompanying amendment of the gray shaft of a signal changed

by the input signal transducer 6 changed into the CIELab space which is the input space of a interpolation operation, and the input signal transducer 6, The virtual gray axiation section 8 to which an operator does an adjustment setup of the gray stem correction section 7 which performs compression processing of a lightness component (L), and the chromaticity value of the black of the hard copy of imagination is connected. Moreover, processing section 5for C a which calculates C value, processing section 5for M b which calculates M value, processing section 5for Y c which calculates Y value, and 5d of processing sections for K which calculate K value are prepared in the interpolation operation part 5.

[0040] If actuation of the gestalt of this operation is explained and CPU1B will receive the command of color correction, in the input signal transformation section 6, RGB->XYZ->Lab conversion will be carried out as an input signal is the color picture information (RGB) on a monitor device. Conversion by this input signal transducer 6 is performed by for example, (1) type of the gestalt of the 1st operation and (2) types. In addition, it is written in the device profile of the monitor device sent with color picture information, and gets down, and each parameter required for this conversion is changed into Lab on the basis of the white (0 Lab;100, 0) of the target monitor device.

[0041] In the gray stem correction section 7, color correction of the input picture signal (Lab) changed by the input signal transducer 6 is carried out, it is changed into L'a'b', and is loaded to RAM3B by the same processing as (4) types of the gestalt of the 2nd operation so that it may be displayed on the same tone as the color picture of a monitor device on color hard copy.

[0042] With the gestalt of this operation, the reference white W of the monitor device under the light source which observes color hard copy, and the color P3 (refer to drawing 5) of the arbitration on this hue line in this case An operator can do an adjustment setup. The reference white of the color picture of a monitor device It becomes the ground white of the paper in which color hard copy is formed. The black of the color picture of a monitor device On the basis of the reference white of a monitor device and the color of a same color phase under the light source which observes color hard copy, the color correction and the compression processing of lightness (L) accompanying amendment of a gray shaft are carried out so that it may become black [the hard copy of the imagination which the operator adjusted according to liking or an input image].

[0043] The color information (L'a'b') loaded to RAM3A is transmitted to the interpolation operation part 5, a interpolation operation is carried out by 5d of processing sections for processing section 5for C a, processing section 5for M b, processing section 5for Y c, and K, and color conversion of L'a'b'->CMYK is performed. In this case, the value of L and a to which compression processing by attachment of the saturation direction was performed, and C, M, Y and K to b value is beforehand set to the color outside the color reproduction range at the coordinate (Lab) on the input space used for a interpolation operation. Moreover, a setup of the output value (C, M, Y, K) over this L and a, and b value is optimization by the CMYK->Lab simulator which used the polynomial and the neural network etc., and the combination of CMYK from which the correction value color difference serves as min is searched for.

[0044]

[Effect of the Invention] According to invention according to claim 1, it is based on the chromaticity value which changed and changed the chromaticity value of the gray shaft of the three-attributes-of-color coordinate of a color with change means according to the lightness of color picture information. With a conversion means Since the color picture information on the monitor device which displays a color picture with a self-luminous color is changed into the control signal of the image formation equipment which forms color hard copy, it becomes possible to form color hard copy by the same color result as the color picture of a monitor device.

[0045] According to invention according to claim 2, the reference white of the color picture of a monitor device It is set as the ground white of the record medium with which color hard copy is formed. The black of the color picture of a monitor device So that it may be set as said reference white under the light source which observes color hard copy, and the black of the virtual hard copy of the chromaticity value of a same color phase With a change means, by

leaning the gray shaft of the three-attributes-of-color coordinate of a color A chromaticity value changes according to the lightness of color picture information, and since it is changed into the control signal of the image formation equipment in which color picture information forms color hard copy with a conversion means based on the chromaticity value which changed It becomes nothing simply setting [of a fine parameter] up to form color hard copy by the same color result as the color picture of a monitor device possible.

[0046] According to invention according to claim 3, with a change means the reference white of the color picture of a monitor device So that it may be set as the ground white of the record medium with which color hard copy is formed and the black of the color picture of a monitor device may be set as the reference white under the light source which observes color hard copy, and the black of the virtual hard copy of the chromaticity value of a same color phase As opposed to the color picture information which the gray shaft of the three-attributes-of-color coordinate of a color was leaned, and compression processing of the color picture information was carried out by the compression means based on the chromaticity value which the chromaticity value changed according to the lightness of color picture information, and changed, and was compressed It has an achromatic color shaft and the input coordinate value to the three-dimension input color space by which partition division was carried out is set as the same unit color space cube. With a interpolation operation means The interpolation operation of the top-most-vertices output value of the color-separation component set as the top-most vertices of the unit color space cube containing this input coordinate value is performed. With a conversion means Since it is changed into the control signal of the image formation equipment with which color picture information forms color hard copy based on a interpolation operation value It becomes nothing extending [of memory] to form color hard copy by the same color result to the color picture of two or more sorts of monitor devices with one kind of color conversion parameter possible.

[0047] According to invention according to claim 4, it becomes possible to adjust color finishing of color hard copy, such as in addition to the effectiveness acquired by invention according to claim 3, choosing the chromaticity value of the hard copy of imagination and emphasizing the property of the color picture information on a monitor device with a selection setting means.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the color inverter which changes the color picture information on the monitor device which displays a color picture with the self-luminous color displayed on TV or a CRT monitor into the control signal of the image formation equipment which forms color hard copy.

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PRIOR ART

[Description of the Prior Art] Hard copy of the color picture displayed on monitor devices, such as TV and CRT When forming on a color record ingredient, and it is low, and the difference of the feeling of vision of the color of a self-luminous color and a reflected color also has the direction of the color temperature of the light source to which the color temperature of the light source which observes hard copy generally observes hard copy unlike the color temperature of a monitor device and it carries out hard copy of the color picture of a monitor device without color correction, there is a problem that the hard copy of different tone from the color picture of a monitor device is formed.
[0003] By JP,1-218288,A, the tristimulus value of the color of the color picture of the color TV under the observation light source of hard copy is calculated, and in order to solve this problem, when carrying out hard copy of the color picture displayed on a color TV to a color record ingredient, the formation approach of the color hard copy which records hard copy on a color record ingredient is indicated so that these tristimulus values may be realized.

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EFFECT OF THE INVENTION

[Effect of the Invention] According to invention according to claim 1, it is based on the chromaticity value which changed and changed the chromaticity value of the gray shaft of the three-attributes-of-color coordinate of a color with change means according to the lightness of color picture information, and is a conversion means, Since the color picture information on the monitor device which displays a color picture with a self-luminous color is changed into the control signal of the image formation equipment which forms color hard copy, it becomes possible to form color hard copy by the same color result as the color picture of a monitor device.
[0045] According to invention according to claim 2, the reference white of the color picture of a monitor device It is set as the ground white of the record medium with which color hard copy is formed. The black of the color picture of a monitor device So that it may be set as said reference white under the light source which observes color hard copy, and the black of the virtual hard copy of the chromaticity value of a same color phase Since it is changed into the control signal of the image formation equipment in which color picture information forms color hard copy with a conversion means based on the chromaticity value from which the chromaticity value changed and changed with change means by leaning the gray shaft of the three-attributes-of-color coordinate of a color according to the lightness of color picture information It becomes nothing simply setting [of a fine parameter] up to form color hard copy by the same color result as the color picture of a monitor device possible.
[0046] According to invention according to claim 3, with a change means the reference white of the color picture of a monitor device So that it may be set as the ground white of the record medium with which color hard copy is formed and the black of the color picture of a monitor device may be set as the reference white under the light source which observes color hard copy, and the black of the virtual hard copy of the chromaticity value of a same color phase As opposed to the color picture information which the gray shaft of the three-attributes-of-color coordinate of a color was leaned, and compression processing of the color picture information was carried out by the compression means based on the chromaticity value which the chromaticity value changed according to the lightness of color picture information, and changed, and was compressed It has an achromatic color shaft and the input coordinate value to the three-dimension input color space by which partition division was carried out is set as the same unit color space cube. With a interpolation operation means Since it is changed into the control signal of the image formation equipment in which the interpolation operation of the top-most-vertices output value of the color-separation component set as the top-most vertices of the unit color space cube containing this input coordinate value is performed, and color picture information forms color hard copy with a conversion means based on a interpolation operation value It becomes nothing extending [of memory] to form color hard copy by the same color result to the color picture of two or more sorts of monitor devices with one kind of color conversion parameter possible.
[0047] According to invention according to claim 4, it becomes possible to adjust color finishing of color hard copy, such as in addition to the effectiveness acquired by invention according to claim 3, choosing the chromaticity value of the hard copy of imagination and emphasizing the

property of the color picture information on a monitor device with a selection setting means.

[Translation done.]

* NOTICES *

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the formation approach of the color hard copy concerning an indication, when the observation light source of color hard copy is made into the reference white of a color TV, it is adapted to the reference white and it is the requisite to say [that color hard copy becomes the almost same tone as the color of the light source of color TV original]. Although surely it is adapted to the white of the light source at the time of observing color hard copy since human being's eye perceives a color by the relative value from a reference white about the color of high saturation, to the color of low saturation near the gray shaft, the difference of a tint will be conspicuous and the vision impressions of the tone of the image of a color TV and hard copy will differ especially about natural images, such as a photograph. On the other hand, when the image of a color TV is reproduced by hard copy as it was, the color which should be white essentially will be bluish and will be reproduced.
[0005] This invention is made in view of the present condition of the color inverter which carries out color conversion of the color picture information on a monitor device which was mentioned above at the image of a color copy, and the purpose is in offering the color inverter which can create the color picture information on a monitor device in the image of hard copy with which the feeling of vision of the same tint is obtained.

[Translation done.]

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MEANS

[Means for Solving the Problem] In order to attain said purpose, invention according to claim 1 The color picture information on the monitor device which displays a color picture with a self-luminous color A change means to be the color inverter changed into the control signal of the image formation equipment which forms color hard copy, and to change the chromaticity value of the gray shaft of the three-attributes-of-color coordinate of a color according to the lightness of said color picture information, It is characterized by having a conversion means to change said color picture information into said control signal, based on the chromaticity value which changed with this change means.
[0007] In order to attain said purpose similarly, invention according to claim 2 The color picture information on the monitor device which displays a color picture with a self-luminous color It is the color inverter changed into the control signal of the image formation equipment which forms color hard copy. The reference white of the color picture of said monitor device is set as the ground white of the record medium with which said color hard copy is formed. So that the black of the color picture of said monitor device may be set as said reference white under the light source which observes said color hard copy, and the black of the virtual hard copy of the chromaticity value of a same color phase The gray shaft of the three-attributes-of-color coordinate of a color is leaned, and it is characterized by having a change means to change a chromaticity value according to the lightness of said color picture information, and a conversion means to change said color picture information into said control signal based on the chromaticity value which changed with this change means.
[0008] In order to attain said purpose similarly, invention according to claim 3 The color picture information on the monitor device which displays a color picture with a self-luminous color It is the color inverter changed into the control signal of the image formation equipment which forms color hard copy. The reference white of the color picture of said monitor device is set as the ground white of the record medium with which said color hard copy is formed. So that the black of the color picture of said monitor device may be set as said reference white under the light source which observes said color hard copy, and the black of the virtual hard copy of the chromaticity value of a same color phase A change means to lean the gray shaft of the three-attributes-of-color coordinate of a color, and to change a chromaticity value according to the lightness of said color picture information, The compression means which carries out compression processing of said color picture information based on the chromaticity value which changed with this change means, Have an achromatic color shaft and receive the same unit color space cube in the three-dimension input color space by which partition division was carried out. It is characterized by having a interpolation operation means to search for said control signal by carrying out a interpolation operation with the top-most-vertices output value of the color-separation component which set the input coordinate of said color picture information compressed by said compression means as the top-most vertices of said unit color space cube including this input coordinate.
[0009] In order to attain said purpose similarly, invention according to claim 4 is characterized by establishing the selection setting means which carries out a selection setup of the chromaticity value of the hard copy of said imagination to invention according to claim 3.

[0010]
[Embodiment of the Invention]
The gestalt of operation of the 1st of [gestalt of the 1st operation] this invention is explained with reference to drawing 1 thru/or drawing 4 . The explanatory view of processing of the gestalt of this operation and drawing 4 of the explanatory view of the RGB space where drawing 1 is used for the input color space of the gestalt of this operation, the block diagram in which drawing 2 shows the configuration of the important section of the gestalt of this operation, and drawing 3 are the explanatory views of the color correction of the gestalt of this operation.
[0011] As shown in drawing 1 , with the gestalt of this operation like TV or a CRT monitor The three-dimension input color space where the input coordinate of the color picture information on the monitor device which displays a color picture with a self-luminous color is set up is made into a RGB color space. This RGB color space It is constituted so that partition division may be carried out and the same unit color space cube may be asked for C, M, Y, and K value which are the control signal of a printer from this RGB color space as an output value over the input coordinate value (RGB value) of the color picture information on a monitor device. In this case, the unit color space cube containing the input coordinate value of the color picture information on a monitor device is chosen, and linear interpolation is given based on the output value corresponding to the top-most vertices set up beforehand and input coordinate value of the selected unit color space cube, and it is constituted so that the output value corresponding to C, M, Y, and K value which are the control signal of a printer may be calculated.
[0012] As shown in drawing 2 , based on ROM2 by which the output value (C, M, Y, K) corresponding to the top-most vertices of an input color space was beforehand stored in CPU1 which controls the whole actuation, RAM3 to which the temporary storage of the input image data is carried out, and an input signal, as for the gestalt of this operation, the interpolation operation part 5 which carries out the interpolation operation of C, M, Y, and K value with reference to the storing data of ROM2 is connected. Processing section 5for C a which calculates C value, processing section 5for M b which calculates M value, processing section 5for Y c which calculates Y value, and 5d of processing sections for K which calculate K value are prepared in this interpolation operation part 5.
[0013] First, the processing of the decision of an output value (C, M, Y, K) to the top-most vertices (RGB) of the input color space stored in ROM2 is explained. As shown in drawing 3 , in the conversion process 10, the top-most vertices (RGB) of a unit color space cube are changed into a tristimulus value XYZ. This conversion has the approach of displaying and carrying out the direct colorimetry of the color of RGB corresponding to top-most vertices to the target monitor device, and the approach of calculating by the degree type using the chromaticity coordinate of the fluorescent substance of a monitor device.
[0014]
X=(xR /yR)L(vR)+(xG /yG)L(vG)+(xB /yB)L(vB) Y=L(vR)+L(vG)+L(vB)
Z=(zR/yR) L(vR) +(zG/yG) L(vG) +(zB/yB) L (vB) ... (1)
However, in (1) type, a=R, and (G, B) of xa, yb, and za (a=R, G, B) are brightness values. [the chromaticity coordinate of a fluorescent substance, L (va) and]
[0015] Next, tristimulus values X, Y, and Z are changed into CIELab which is typical uniform color space by the degree type in the conversion process 11.
[0016]
L*=116(Y/Y0)1/3 -16 a*=500[(X/X0)1/3 -(Y/Y0)1/3]
b*=200 [(Y/Y0) 1/3-(Z/Z0) 1 / 3] ... (2)
However, in (2) types, Y/Y 0> 0.008856, and X0, Y0 and Z0 are the values of a criteria reflector.
[0017] Here, in the object color like hard copy, although L* is settled in 0-100, since an upper limit is not defined to the input of the self-luminous color of a monitor device, the values X0, Y0, and Z0 of a criteria reflector are used as a tristimulus value of the reference white in the target monitor device.
[0018] Thus, in the target monitor device, in the color conversion process 12, color correction of the data of top-most vertices changed into L, a, and b on the basis of white is carried out so that it may become the same tone as the color displayed on the monitor device on color hard

copy. With the gestalt of this operation, the data L, a, and b of top-most vertices are amended according to L (lightness) for which it asked in the process 11 based on correction value L'ah to the input L as shown in drawing 4 , and bh. For example, an input of the top-most-vertices data L; 50, a; 30, and b;-30 performs the next interpolation operation.
[0019] ah=-2+(0- (-2))/(60-50)/(60-40) =-1bh=-6+(-4- (-6))/(60-50) (/(60-40)) =-5[0020] these -- a result -- from -- a degree -- a type -- L -- ' -- a -- ' -- b -- ' -- asking -- having .
[0021]
L'=40+(50-40)/(60-50) (/(60-40)) =45 a'=30+ah=30-1=29 b'=-30+bh=-30-5=-35 ... (3)
[0022] In addition, the correspondence relation of drawing 4 performs the colorimetry to the combination of C, M, Y, and K from which target display of the gray (L=0-100, a=b=0) of a monitor device and output color of a printer become the same tone, and it is set up beforehand and it places it.
[0023] and -- conversion -- a process -- 13 -- above -- asking -- having had -- top-most vertices -- data -- corresponding -- correction value -- L -- ' -- a -- ' -- b -- ' -- a printer -- a control signal -- it is -- C -- M -- Y -- K value -- changing -- as a top-most-vertices output value -- ROM2 -- storing . L in this conversion process 13, a, b->C, M and Y, and K conversion are the optimization and trial-and-error by C, M, Y, K->L and a which used a polynomial and new RARUTTO, and b simulator, and are performed by correction value L', the method of looking for the combination of C, M, Y, and K from which a, 'b', and the color difference serve as min, etc.
[0024] The gestalt of operation of the 2nd of [gestalt of the 2nd operation] this invention is explained with reference to drawing 5 . Drawing 5 is the explanatory view of the color correction of the gestalt of operation of the 2nd of this invention.
[0025] The processings of the color correction process 12 shown in drawing 3 to the gestalt of the 1st operation which already explained the gestalt of this operation differ. Drawing 5 (a) is drawing which made L shaft perpendicular and looked at the CIELab color space from width. P1 For example, the color of record ingredients, such as paper which forms the color hard copy under the light source which observes color hard copy like the light source of d50, (white point by the side of hard copy), P2 is the black (black point by the side of hard copy) of the hard copy under the light source which observes hard copy, and the original gray shaft Ag by the side of hard copy serves as a straight line which connects P1 and P2.
[0026] It is drawing which looked at a lightness side -- the dotted line which connects P2 and P3 with (a) shows this drawing (b) -- from right above (L shaft orientations). The color which brought W to the lightness [value / (a, b) / of the reference white (white p0int by the side of a monitor) of the monitor device under the light source which observes color hard copy / chromaticity] side, and P3 show the color of the arbitration on W and this hue line.
[0027] In the gestalt of this operation, in a color correction process (it corresponds to the color correction process 12 of the gestalt of the 1st operation), as shown in drawing 5 (a), color correction of the gray shaft of input color information is carried out so that it may become gray shaft Ag' of the imagination which connects P1 and P3.
[0028] namely, -- conversion -- a process (it corresponds to the conversion process 11 of drawing 3) -- L -- a -- b -- changing -- having had -- top-most vertices -- data -- color correction -- a process (it corresponds to the color correction process 12 of drawing 3) -- it is -- a degree -- a type -- L -- ' -- a -- ' -- b -- ' -- changing -- having .
[0029]
L'=L(W. L-B.L) /100+B.L a'=a+(W. a-B.a) (L/100) +B.a ... (4)
b'=b+(W. b-B.b) (L/100) +B.b -- here, the coordinate value of P1 of drawing 5 (L, a, b), B.L, B.a, and B.b of W.L, W.a, and W.b are the coordinate values of P3 of drawing 5 (L, a, b).
[0030] conversion to C, M, Y, and K value which are the control signal of a printer from the correction value (L', a', and b -- ') corresponding to the top-most vertices for which it asked as mentioned above also with the gestalt of this operation in the conversion process (it corresponds to the conversion process 13 of drawing 3) is performed, and the obtained data are stored in ROM2 as a top-most-vertices output value.

[0031] The gestalt of operation of the 3rd of [gestalt of the 3rd operation] this invention is explained with reference to drawing 6 and drawing 7 . The explanatory view of the CIELAB color space where drawing 6 is used for the input color space of the gestalt of this operation, and drawing 7 are the block Figs. showing the configuration of the important section of the gestalt of this operation.
[0032] With the gestalt of this operation, like TV or a CRT monitor to the color picture information on the monitor device which displays a color picture with a self-luminous color Lab conversion is performed and it considers as a CIELab color space as shows the three-dimension input color space where an input coordinate is set up to drawing 6 . This CIELab color space It is constituted so that partition division may be carried out and the same unit color space cube may be asked for C, M, Y, and K value which are the control signal of a printer from this CIELab color space as an output value over the input coordinate value (L*, a*, b* value) of the color picture information on a monitor device. In this case, the unit color space cube containing the input coordinate value of the color picture information on a monitor device is chosen, and linear interpolation is given based on the output value corresponding to the top-most vertices set up beforehand and input coordinate value of the selected unit color space cube, and it is constituted so that the output value corresponding to C, M, Y, and K value which are the control signal of a printer may be calculated.
[0033] As shown in drawing 7 , the gestalt of this operation to CPU1A which controls the whole actuation The storing data of ROM2A are referred to based on ROM2A in which the output value (C, M, Y, K) corresponding to the top-most vertices of an input color space was stored beforehand, RAM3A to which the temporary storage of the input image data is carried out, and an input signal. The interpolation operation part 5 and the input picture signal which carry out the interpolation operation of C, M, Y, and K value are based on the device profile of an input side. The gray stem correction section which performs color correction accompanying amendment of the gray shaft of a signal changed by the input signal transducer 6 changed into the CIELab space which is the input space of a interpolation operation, and the input signal transducer 6, and compression processing of a lightness component (L) is connected. Moreover, processing section 5for C a which calculates C value, processing section 5for M b which calculates M value, processing section 5for Y c which calculates Y value, and 5d of processing sections for K which calculate K value are prepared in the interpolation operation part 5.
[0034] If actuation of the gestalt of this operation is explained and CPU1A will receive the command of color correction, in the input signal transformation section 6, RGB->XYZ->Lab conversion will be carried out as an input signal is the color picture information (RGB) on a monitor device. Conversion by this input signal transducer 6 is performed by for example, (1) type of the gestalt of the 1st operation and (2) types. In addition, it is written in the device profile of the monitor device sent with color picture information, and gets down, and each parameter required for this conversion is changed into Lab on the basis of the white (0 Lab;100, 0) of the target monitor device.
[0035] In the gray stem correction section 7, color correction of the input picture signal (Lab) changed by the input signal transducer 6 is carried out, it is changed into L'a'b', and is loaded to RAM3A by the same processing as (4) types of the gestalt of the 2nd operation so that it may be displayed on the same tone as the color picture of a monitor device on color hard copy.
[0036] By this color correction, the reference white of the color picture of a monitor device turns into ground white of the paper which forms color hard copy, and compression processing of the color correction accompanying [so that it may become black] amendment of a gray shaft and the lightness component (L) of the reference white of the color picture of the monitor device under the light source to which the black of the color picture of a monitor device observes color hard copy, and the hard copy of imagination with the chromaticity value of a same color phase is carried out.
[0037] The color information (L'a'b') loaded to RAM3A is transmitted to the interpolation operation part 5, a interpolation operation is carried out by 5d of processing sections for processing section 5for C a, processing section 5for M b, processing section 5for Y c, and K, and color conversion of L'a'b'->CMYK is performed. In this case, the value of L and a to which

compression processing by attachment of the saturation direction was performed, and C, M, Y and K to b value is beforehand set to the color outside the color reproduction range at the coordinate (Lab) on the input space used for a interpolation operation. Moreover, a setup of the output value (C, M, Y, K) over this L and a, and b value is optimization by the CMYK->Lab simulator which used the polynomial and the neural network etc., and the combination of CMYK from which the correction value color difference serves as min is searched for.
[0038] The gestalt of operation of the 4th of [gestalt of the 4th operation] this invention is explained with reference to drawing 8 . Drawing 8 is the block diagram showing the configuration of the important section of the configuration of this operation.
[0039] To CPU1B which controls the whole actuation by the gestalt of this operation to be shown in drawing 8 The storing data of ROM2B are referred to based on ROM2B in which the output value (C, M, Y, K) corresponding to the top-most vertices of an input color space was stored beforehand, RAM3B to which the temporary storage of the input image data is carried out, and an input signal. The interpolation operation part 5 and the input picture signal which carry out the interpolation operation of C, M, Y, and K value are based on the device profile of an input side. The color correction accompanying amendment of the gray shaft of a signal changed by the input signal transducer 6 changed into the CIELab space which is the input space of a interpolation operation, and the input signal transducer 6, The virtual gray axiation section 8 to which an operator does an adjustment setup of the gray stem correction section 7 which performs compression processing of a lightness component (L), and the chromaticity value of the black of the hard copy of imagination is connected. Moreover, processing section 5for C a which calculates C value, processing section 5for M b which calculates M value, processing section 5for Y c which calculates Y value, and 5d of processing sections for K which calculate K value are prepared in the interpolation operation part 5.
[0040] If actuation of the gestalt of this operation is explained and CPU1B will receive the command of color correction, in the input signal transformation section 6, RGB->XYZ->Lab conversion will be carried out as an input signal is the color picture information (RGB) on a monitor device. Conversion by this input signal transducer 6 is performed by for example, (1) type of the gestalt of the 1st operation and (2) types. In addition, it is written in the device profile of the monitor device sent with color picture information, and gets down, and each parameter required for this conversion is changed into Lab on the basis of the white (0 Lab;100, 0) of the target monitor device.
[0041] In the gray stem correction section 7, color correction of the input picture signal (Lab) changed by the input signal transducer 6 is carried out, it is changed into L'a'b', and is loaded to RAM3B by the same processing as (4) types of the gestalt of the 2nd operation so that it may be displayed on the same tone as the color picture of a monitor device on color hard copy.
[0042] With the gestalt of this operation, the reference white W of the monitor device under the light source which observes color hard copy, and the color P3 (refer to drawing 5) of the arbitration on this hue line in this case An operator can do an adjustment setup. The reference white of the color picture of a monitor device It becomes the ground white of the paper in which color hard copy is formed. The black of the color picture of a monitor device On the basis of the reference white of a monitor device and the color of a same color phase under the light source which observes color hard copy, the color correction and the compression processing of lightness (L) accompanying amendment of a gray shaft are carried out so that it may become black [the hard copy of the imagination which the operator adjusted according to liking or an input image].
[0043] The color information (L'a'b') loaded to RAM3A is transmitted to the interpolation operation part 5, a interpolation operation is carried out by 5d of processing sections for processing section 5for C a, processing section 5for M b, processing section 5for Y c, and K, and color conversion of L'a'b'->CMYK is performed. In this case, the value of L and a to which compression processing by attachment of the saturation direction was performed, and C, M, Y and K to b value is beforehand set to the color outside the color reproduction range at the coordinate (Lab) on the input space used for a interpolation operation. Moreover, a setup of the output value (C, M, Y, K) over this L and a, and b value is optimization by the CMYK->Lab

simulator which used the polynomial and the neural network etc., and the combination of CMYK from which the correction value color difference serves as min is searched for.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
**
[Drawing 1] It is the explanatory view of RGB space used for the input color space of the gestalt of operation of the 1st of this invention.
[Drawing 2] It is the block diagram showing the configuration of the important section of the gestalt of this operation.
[Drawing 3] It is the explanatory view of processing of the gestalt of this operation.
[Drawing 4] It is the explanatory view of the color correction of the gestalt of this operation.
[Drawing 5] It is the explanatory view of the color correction of the gestalt of operation of the 2nd of this invention.
[Drawing 6] It is the explanatory view of a CIELAB color space used for the input color space of the gestalt of operation of the 3rd of this invention.
[Drawing 7] It is the block Fig. showing the configuration of the important section of the gestalt of this operation.
[Drawing 8] It is the block diagram showing the configuration of the important section of the 4th configuration of operation of this invention.
[Description of Notations]
1, 1A, 1B CPU
2, 2A, 2B ROM
3, 3A, 3B RAM
5 Interpolation Processing Section
5a The processing section for C
5b The processing section for M
5c The processing section for Y
5d It is the section from the city for K.
6 Input Signal Transducer
7 Gray Stem Correction Section
8 Virtual Gray Axiation Section

[Translation done.]

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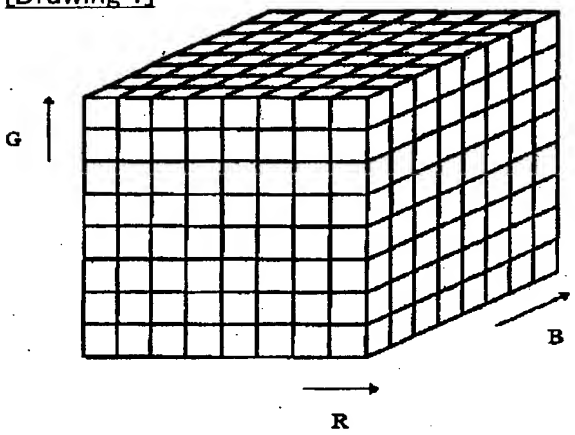
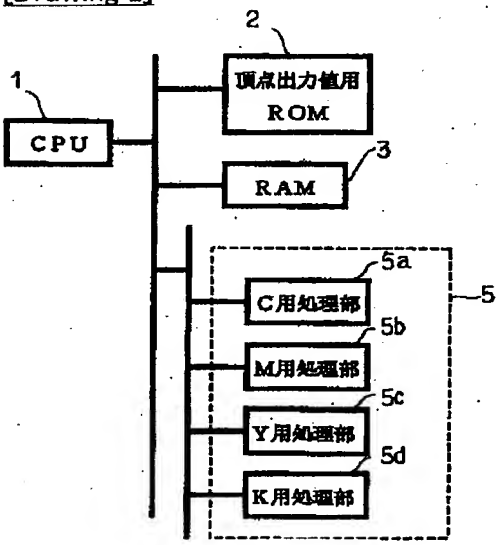
DRAWINGS

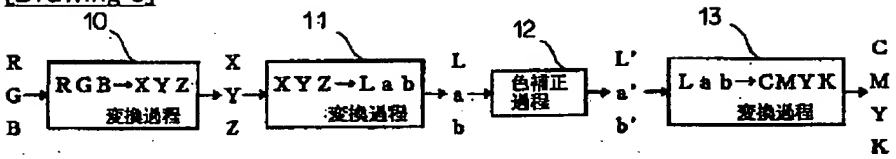
[Drawing 1]



[Drawing 2]



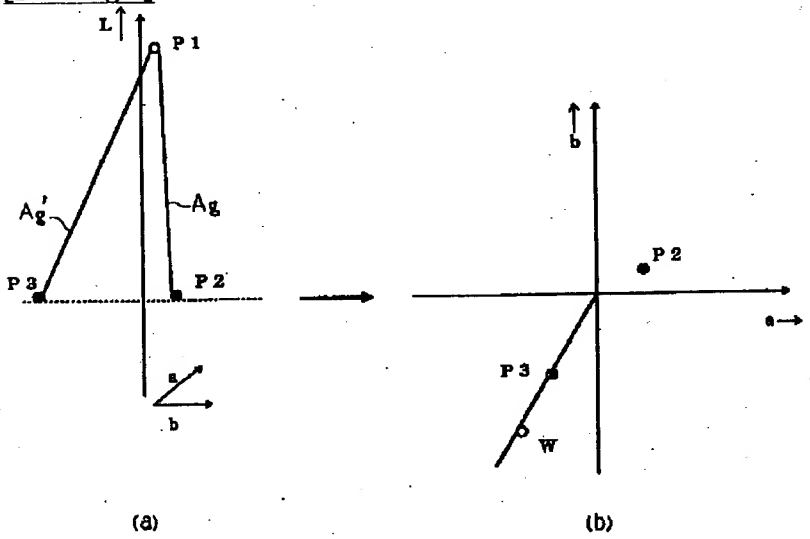
[Drawing 3]



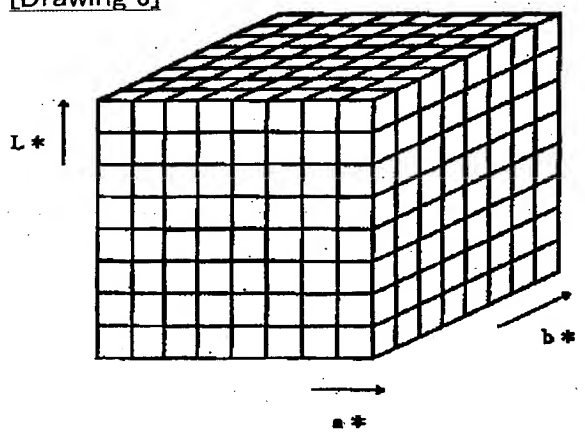
[Drawing 4]

L	L'	ah	bh
0	15	−3.5	−10.0
20	25	−3.0	−9.0
40	40	−2.0	−6.0
60	60	0.0	−4.0
80	70	0.7	−4.0
100	90	1.0	−3.5

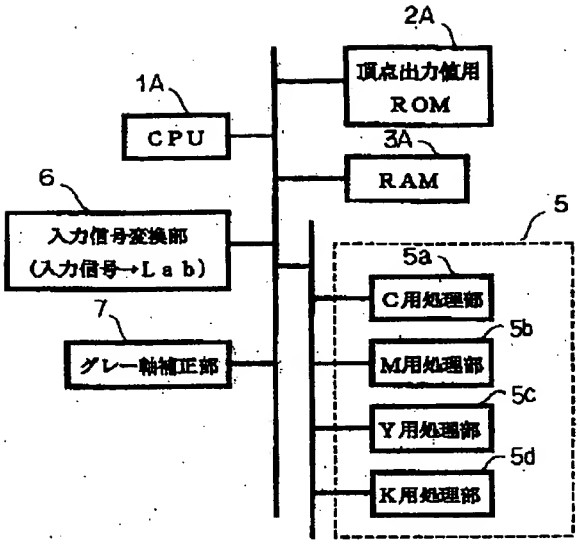
[Drawing 5]



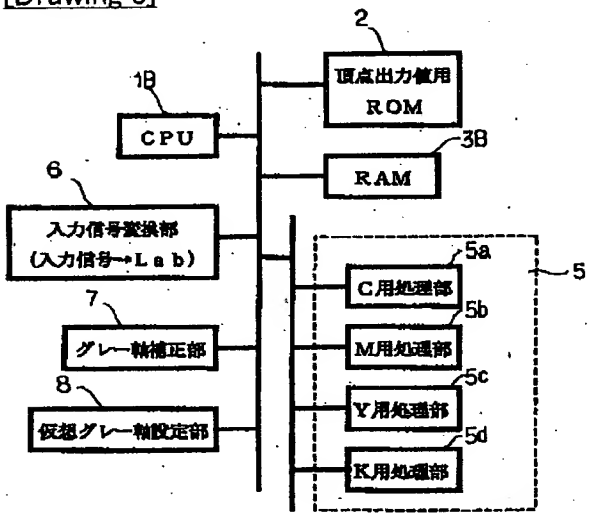
[Drawing 6]



[Drawing 7]



[Drawing 8]



[Translation done.]